

THE RELATIONSHIP BETWEEN *PEDALIODES PERPERNA*
AND *PETRONIUS* (SATYRIDAE), WITH THE
DESCRIPTION OF A NEW SUBSPECIES

LEE D. MILLER

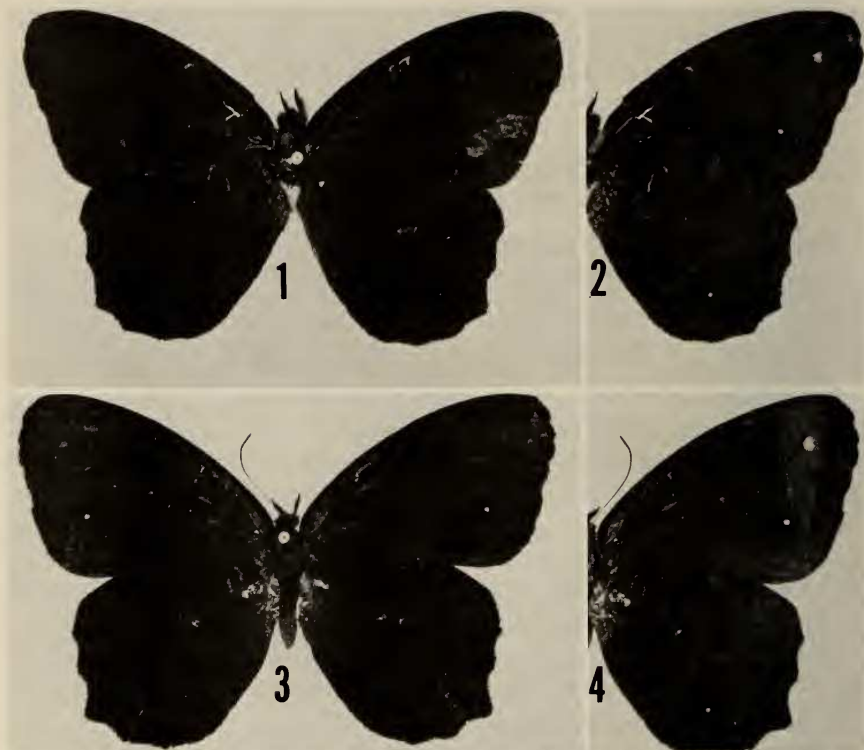
Allyn Museum of Entomology of the Florida State Museum,
3621 Bay Shore Road, Sarasota, Florida 33580

ABSTRACT. The species *Pedaliodes perperna* and *P. petronius* are compared and confirmed as separate species, rather than as forms of one species. *Pedaliodes petronius kerrianna* (La Mesa, near El Valle, Cocle, Panama) is described as new. The habits and habitat of the new subspecies are discussed and a possible foodplant association proposed. Adults and male and female genitalia of both species are illustrated and discussed.

The interrelationship between *Pedaliodes perperna* (Hewitson) and *P. petronius* Grose-Smith has puzzled workers for years. Both species look rather similar, but there are significant differences in their sizes (*petronius*: forewing length about 35 mm, vs. less than 30 mm for *perperna*), wing shapes, maculation and the genitalia. Weymer (1912: 253) classified *petronius* as a ♀ form of *perperna*, the fact that the type of the former was actually a ♂ notwithstanding. *P. petronius* is one of the largest *Pedaliodes* and certainly is the largest member of the genus occurring in Central America. The differences that are apparent when the two taxa are examined are of a nature that it seems incredible that they were ever considered to be conspecific.

Superficial characteristics clearly separate *petronius* from *perperna*, but genitalic characters are even more dramatic. The penis of *petronius* (Fig. 14) is narrow, straight and not contorted in contradistinction to the contorted, stout penis of *perperna* (Fig. 13) and most other *Pedaliodes*. The ♂ genitalia of *P. petronius* are somewhat reminiscent of those of *Praepronophila* Forster (see Forster, 1964:183, fig. 263), a very different butterfly in all other respects. The ♀ genitalia are at least as dramatic, especially as regards the setose, ornate lamella antevaginalis of *petronius* (Fig. 16), as opposed to the simple structure of *perperna* (Fig. 15) and other, less spectacular differences. Perhaps *petronius* should be placed in another genus, but I have not yet examined enough "*Pedaliodes*" to determine whether this separation would be justified; therefore, *petronius* provisionally remains in *Pedaliodes* but as a species separate from *perperna*.

Ecological separations also support the separation of the two species. *P. petronius* usually flies below 1000 m elevation wherever it has been recorded with adequate altitudinal data, whereas all of the specimens of *perperna* that I have seen have come from 1500-2000 m elevation. The ecological niche of *petronius* apparently is somewhat different, as is detailed in the description of the northern population of *petronius*.



FIGS. 1-4. *Pedaliodes perpenna* (Hewitson). 1 & 2, syntype ♂, upper (1) and under (2) surfaces, no data (Allyn Museum photo no. 040979-4/5; 3 & 4, syntype ♀, upper (3) and under (4) surfaces, no data (Allyn Museum photo no. 040979-6/7). Both specimens are in British Museum (Natural History) collection.

The differences here cited are certainly enough to ascertain that *Pedaliodes perpenna* and *P. petronius* are separate species that replace one another altitudinally and are not even closely related within the genus *Pedaliodes*.

Pedaliodes perpenna (Hewitson)

(Figs. 1-4, 13, 15a-b)

Pronophila perpenna Hewitson (1862:16-17). Type-locality not specified, but stated to be Venezuela by W. F. Kirby (1871:104). ♂ and ♀ syntypes in BM (see below) [examined].

Pronophila satyroides C. and R. Felder (1867:469-470). Type-locality: Caracas, Venezuela. Syntypes should be in BM, but not located.

This species was described well by Hewitson (1862), and the ♂ genitalia were figured by Forster (1964:166; fig. 224), though the orientation is different than that shown here. I can add little to the super-

ficial description of either the δ or of the φ , except to state that some Costa Rican φ specimens have the extradiscal area of the upper forewing strongly laved with rufous, thereby setting off the ocellus in Cu_1 - Cu_2 more than is shown in the figure of a Venezuelan specimen.

The δ genitalia (Fig. 13) are of the *Pedaliodes* type as illustrated by Forster (1964: figs. 198-260) with the contorted and complex penis. This organ is relatively shorter than is that of *petronius*, which in turn is relatively very straight and simple. The valva has a bilobate tip and no dorsal tooth like that which characterizes *petronius*.

Female genitalia (Fig. 15) with simple, lightly sclerotized lamella ante- and postvaginalis, the latter with few setae. Width of lamella antevaginalis constant and attachment to ductus bursae simple. Antrum simple, ductus bursae only moderately sclerotized with paired dorsal supportive bars; ductus seminalis attached at juncture of ductus bursae and corpus bursae. Signa well developed with external spines.

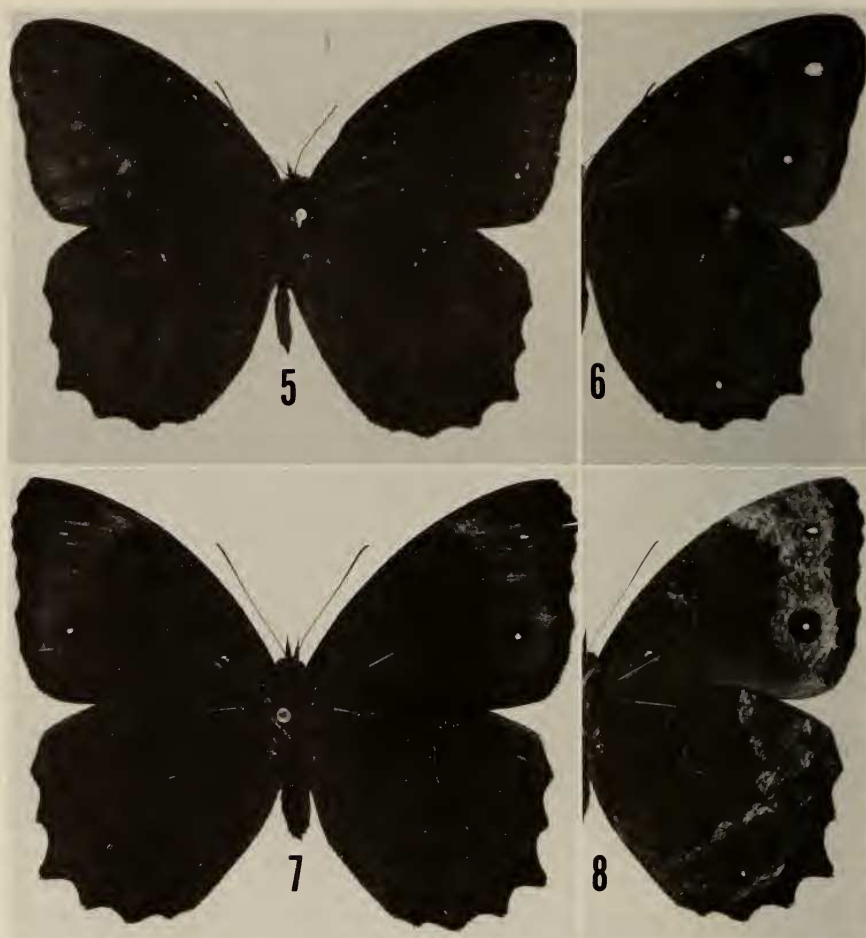
This species is apparently seldom common throughout its rather broad (for a *Pedaliodes*) range. I have seen specimens from Costa Rica, Panama, Colombia and Venezuela, but from no locality have I enough material to pass judgment on possible geographic differentiation. All of the specimens have come from between 1500 and 2200 m elevation. By contrast, the following species is from a lower elevation, and two distinct geographic segregates have evolved.

I had initially intended to designate the δ specimen as the Lectotype for *P. perperna*, but several circumstances make this untenable. First, this specimen has no abdomen, hence its genitalia cannot be checked if the popular conception of *perperna* proves to encompass more than one species. Second, it is possible only by secondary sources to determine from which population of the species the syntypes were taken. I suspect that Kirby (1871) was correct, and the specimens came from Venezuela, and further, it is likely that either the hills around Caracas or the vicinity of Colonia Tovar was the more precise type locality. This decision, however, should be left to some worker doing a comprehensive revision of this group of *Pedaliodes*.

Pedaliodes petronius petronius Grose-Smith
(Figs. 5-8)

Pedaliodes petronius Grose-Smith (1900:19). Type-locality: Valdivia, Colombia. HT in BM [examined].

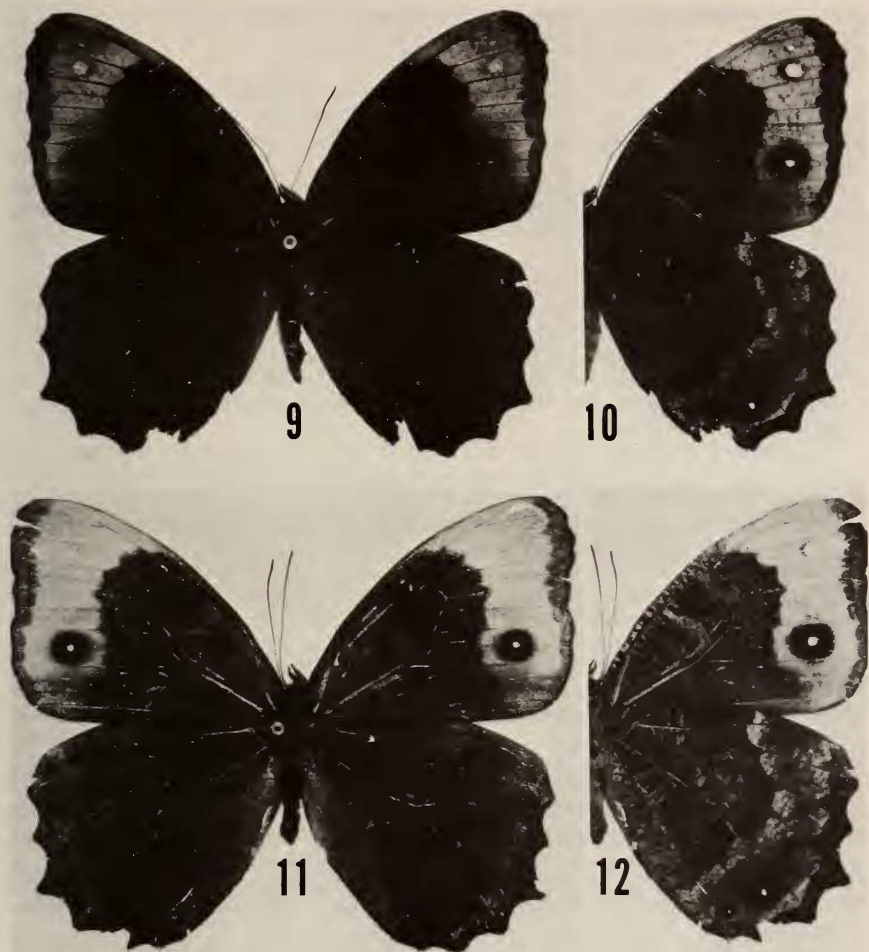
Although this subspecies was described originally from Colombia, by far the majority of specimens have been from Panama, probably because of the recent emphasis on collecting in that country. Most of the specimens seen have come from the lower flanks of Panamanian



FIGS. 5-8. *Pedaliodes petronius petronius* Grose-Smith. 5 & 6, holotype ♂, upper (5) and under (6) surfaces, COLOMBIA: ANTIOQUIA: "Valdevia" (=Valdivia) (Allyn Museum photo 040979-10/11), British Museum (Natural History) collection; 7 & 8, ♀, upper (7) and under (8) surfaces, PANAMA: PANAMA; Cerro Jefe, 900 m, 9.iv.1977 (Allyn Museum photo 090178-9/10), G. B. Small, Jr. collection.

mountains (Cerro Jefe, Panama prov.), apparently in low montane forests (see below for details of the habitat of this species).

The ♂ is totally fuscous above, and the ♀ is only slightly irrorated with lighter scales toward the apex of the forewing. The under side is fuscous boldly marked postdiscally with tan on both wings and with a chestnut discal band; the ocelli stand out clearly against the ground color of both wings.



FIGS. 9-12. *Pedaliodes petronius kerrianna*, new subspecies. 9 & 10, holotype ♂, upper (9) and under (10) surfaces, PANAMA: COCLE: La Mesa, nr. El Valle, 820 m, 5.i.1978; 11 & 12, paratype ♀, upper (11) and under (12) surfaces, PANAMA: COCLE: La Mesa, nr. El Valle, 820 m, 5.i.1978. Both specimens are in Allyn Museum collection.

♂ and ♀ genitalia substantially the same as those of *P. p. kerrianna* (q.v., Figs. 14 and 16).

It does not seem to be a common insect; I have seen only a few examples, but it may not always be rare where it is found if encountered at the right time. Superficially, it seems to resemble members of the *poesia* group, but the genitalia are totally unlike any members of that complex.

Pedaliodes petronius kerrianna, new subspecies

(Figs. 9-12, 14, 16a-c)

Male (Figs. 9-10). Head, thorax and abdomen dorsally covered with fuscous hairs; head and thorax with gray-brown ventral hairs, abdomen with buff ones ventrad. Palpi covered with fuscous dorsal and ventral and white lateral hairs. Legs with light gray-brown hairs.

Upper surfaces of both wings deep fuscous with subapical buff patch from just outside forewing cell to 1A and usually small, barely noticeable black ocellus placed on inner part of buff patch in Cu_1 - Cu_2 . Wings with narrow dark marginal line following contours of wings.

Under forewing basically fuscous with markings as in *p. petronius*, but differs as follows: between cell and margin is large buff patch speckled with fuscous scales, positioned about as on upper side; black ocellus with white pupil in Cu_1 - Cu_2 larger than in *p. petronius*; subapical white ocellus in M_2 - M_3 much larger than that of *petronius*; and with supernumerary white subapical point in M_1 - M_2 . Under hindwing about as in *p. petronius*, except brighter and more contrasting and submarginal ocellus in Cu_1 - Cu_2 larger and more prominent.

Male genitalia as illustrated (Fig. 14), similar to nominate subspecies, but dorsal tooth on valva somewhat less pointed and prominent. The long, straight penis and the toothed valva immediately distinguish this species from *P. perperna*.

Length of forewing of holotype δ 34.1 mm; those of the 22 δ paratypes at hand range from 33.3 to 34.6 mm, averaging 34.14 mm.

Female (Figs. 11-12). Head, thorax, abdomen and appendages about as in δ . Upper surface similar to nominate subspecies except for buff subapical forewing patch with its more prominent black, white pupilled ocellus in M_1 - M_2 of the same wing and at least hint of hindwing submarginal ocellus in Cu_1 - Cu_2 .

Under surface much like that of *p. petronius*, but characterized by brighter buff forewing subapical patch, larger forewing and hindwing submarginal black ocelli with white pupils in Cu_1 - Cu_2 and generally more contrasting appearance.

Female genitalia (Fig. 16) very ornate with numerous, presumably sensory scales and setae on VIII tergite and lamella postvaginalis. The normally membranous area anterior of the papillae anales moderately sclerotized in this species; inner margin of lamella postvaginalis spinose and bearing two separate types of scales: a multidentate, short scale and a bidentate longer one. Lamella antevaginalis lightly to moderately sclerotized and cup-shaped; antrum heavily sclerotized and ornate. Ductus bursae similar to that of *perperna*, but tapered toward antrum. Signae longer than those of *perperna*. Attachment of ductus bursae to lamella antevaginalis (sterigma) much more heavily sclerotized than in *perperna*.

Lengths of forewings of the four η paratypes at hand range from 36.0 to 37.4 mm, averaging 36.75 mm.

Described from 59 specimens, 48 males and 11 females, from Cocle province, Panama.

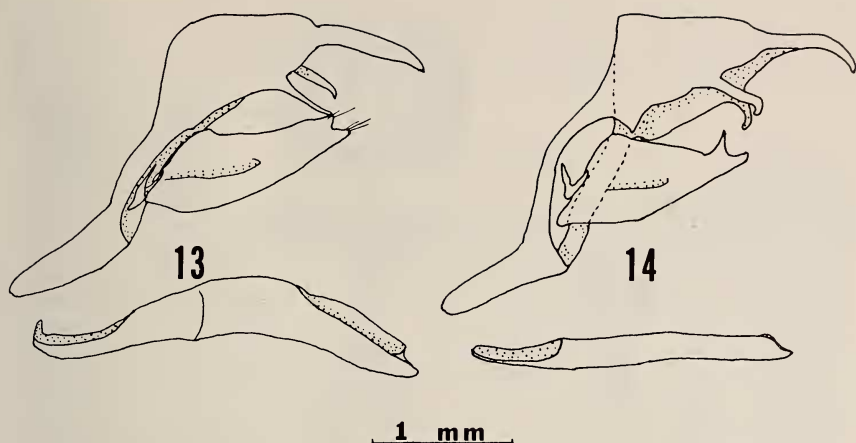
Holotype δ : PANAMA: COCLE: La Mesa, near El Valle, 820 m; 5.i.1978 (G. B. Small).

Paratypes: 47 δ , 11 η , same locality and collector as holotype, variously from November, December, January, June and July, 1978-1983.

Disposition of type-series: holotype δ , 22 δ and four η paratypes in Allyn Museum of Entomology; 25 δ and seven η paratypes returned to Mr. Small for his collection and for distribution to other museums.

This subspecies is named at Mr. Small's request for Kerry Ann (Mrs. Robert) Dressler who discovered the original Panamanian colony. She, along with Mr. Small, has materially increased our understanding of Central American lepidopterozoology, especially of the fauna of Panama and Costa Rica.

Mr. Small (pers. comm.) has written me extensively on the habits

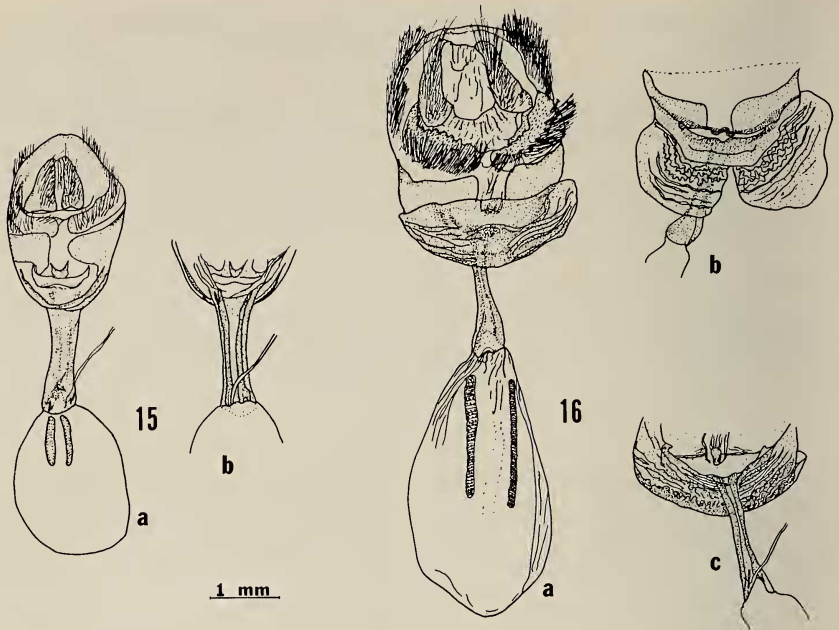


FIGS. 13 & 14. ♂ genitalia of *Pedaliodes*. 13, *P. perperna* (Hewitson); genitalia preparation M-6653-v (Lee D. Miller); VENEZUELA: DIST. FED.: El Junquito. 14, *P. petronius kerrianna* new subspecies, paratype; genitalia preparation M-6599-v (Lee D. Miller); PANAMA: COCLE: La Mesa, nr. El Valle. Both specimens are in Allyn Museum collection.

and habitat of this insect, as follows: "The locality is La Mesa, ca. 850 m, above the town of El Valle de Anton, Cocolé Province. The butterfly flies in a very wet thickety area with scattered thin trees festooned with moss and bromeliads (it does not fly in the surrounding thick forest). The average canopy height is about 15 ft., and paths through the area quickly become quagmires. Whether it is a natural formation or secondary succession following clearing of thick forest is problematical. A thick-leaved *Clusia* (HYPERICACEAE) is abundant as are a number of MELASTOMACEAE, including *Miconia oinochrophylla* Donn.-Sm. and *Tococca guianensis* Aubl. Bromeliads on the ground are common, especially *Guzmania musaica* (Linden and Andre) Mez. in Dc. A broad-leaved cane type grass, *Olyra standleyi* Hitchc., is very abundant, and I strongly suspect that this is the larval food-plant. It is noteworthy that this grass is abundant near the top of Cerro Jefe, Panama Province, where typical *petronius* flies, and that this grass is not found in the thick forest, apparently needing a well lighted area in order to thrive."

Small states further, "In cloudy weather (which is most of the time) the butterfly makes rather short flights and alights low in the cane or other vegetation. However, when the sun shines brightly, it flies strongly and over the tops of the thickets and is very difficult to net. It generally flies from around 9:30 to 11:30 A.M.

"I have visited the locality in November, December, January, June



FIGS. 15 & 16. ♀ genitalia of *Pedaliodes* species. 15, *P. perpenna* (Hewitson); VENEZUELA: DIST. FED.: El Junquito; genitalia preparation M-6554 (Jacqueline Y. Miller); a: ventral view; b: dorsal view of sterigma and ductus bursae. 16, *P. petronius kerrianna*, new subspecies; PANAMA. COCLE: La Mesa, nr. El Valle; genitalia preparation M-6662 (Jacqueline Y. Miller); a: ventral view; b: ventral view of sterigma and ductus bursae with lamella antevaginalis partially removed; c: dorsal view of sterigma and ductus bursae.

and July and have observed or captured it on each occasion. It appears to be particularly numerous in November, although not abundant. At other times, it was in rather small numbers. It probably flies in every month, as I have records of typical *petronius* from Cerro Jefe in March and April."

An additional ♀ specimen apparently of *kerrianna* was collected by Mr. Small at Moravia, Cartago, Costa Rica, at 910 m (3000 ft.) elevation on 27 July 1965. I have seen 13 other specimens collected by R. Hesterberg at the same locality, though sometimes higher on the mountain. He states that *petronius* is found at elevations to nearly 1500 m, but that the ecological preference cited by Mr. Small is true of the Costa Rican specimens as well. These specimens and others have been excluded from the type-series because the available material differs very slightly from the La Mesa specimens. P. J. deVries (pers. comm.) has reported other Costa Rican captures, and comments further on the ecological preferences of *kerrianna*. He says that it flies between 800

and 1000 m on the eastern slope of the Sierra de Talamanca, more specifically in the Valle de Reventazon along the Rio Pacadre in the Rio Chirripo region. He evidently has not found it at as high elevation as has Mr. Hesterberg.

ACKNOWLEDGMENTS

Many people provided information and inspiration for this article. Plant identifications were provided by Drs. Henry Stockwell and Annette Aiello of the Smithsonian Tropical Research Institute, Barro Colorado Island, Panama, and points of nomenclature (especially the authors of the plants) were confirmed by Dr. David Hall of the Florida State Museum, Gainesville, Florida. The authorities at the British Museum (Natural History), London, England, especially Messrs. R. I. Vane-Wright and P. R. Ackery, allowed me access to the type specimens of both *Pedaliodes petronius* and *perperna* and greatly assisted me in other ways during my visit to London in 1979. Mr. Philip J. DeVries, Department of Zoology, University of Texas, Austin, Texas, and Richard L. Hesterberg, formerly of San Jose, Costa Rica, and now of Clearwater, Florida, provided habitat and range information on Costa Rican populations of *kerrianna*. Mrs. Robert (Kerry Ann) Dressler originally found the El Valle population of the butterfly named after her. The photographs were made by the late Dr. A. C. Allyn and my wife and colleague, Jacqueline, of this institution, and they also read and critically reviewed the manuscript. J. Miller also provided the female genitalic dissections and analyses. Mr. Michael J. Adams, Blandford, Dorset, England, answered innumerable questions about the taxonomy of Pronophilini. Clearly, Mr. Gordon B. Small, Jr., Balboa, Canal Zone, Panama, deserves special thanks, since it was he who first provided me with material of both *petronius* and *kerrianna* and gave the detailed habitat notes quoted herein. I must express my heartfelt gratitude to all of these people for their enthusiastic cooperation.

LITERATURE CITED

- FELDER, C. & R. 1867 [1864-1867]. Reise der Osterreichischen Fregatte 'Novara' . . . Zool. 2. Lepidoptera. Carl Gerold's Sohn, Wien. i-vi + 548 pp.; ill.
- FORSTER, W. 1964. Beiträge sur Kenntnis der Insektenfauna Boliviens XIX. Lepidoptera III. Satyridae. Veröff. Zool. Staatsamml. München 8:51-188; ill.
- GROSE-SMITH, H. 1900. Description in Grose-Smith and W. F. Kirby, Rhopalocera Exotica. London, priv. publ., p. 19.
- HEWITSON, W. C. 1862. On *Pronophila*, a genus of the Diurnal Lepidoptera; with figures of the new species, and reference to all those which have been previously figured or described. Trans. Entomol. Soc. London (3)1:1-17; ill.
- KIRBY, W. F. 1871. A synonymic catalogue of diurnal Lepidoptera. John Van Voorst, London. iii-v + 690 pp.
- WEYMER, G. 1912. Genus *Pedaliodes*, in A. Seitz, ed., Macrolepidoptera of the world 5:250-262.